

GONIOZUS INDICUS ASH.—A NATURAL ENEMY OF THE  
SUGARCANE WHITE MOTH BORER (*SCIRPOPHAGA*  
*RHODOPROCTALIS*).

BY

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INTRODUCTION.

During the course of investigations on *Scirpophaga*, seven larval parasites have been noted by the authors. The results of the studies of four of them, viz., *Elasmus zehntneri* Ferr., *Stenobracon nicevillei* Bingham, *Rhaconotus scirpophagae* Wlk., and *Stenobracon deesae* Cam., have already been published (Cherian and Israel, 1937, 1938). *Goniozus indicus* which forms the subject matter of the present paper belongs to the family Bethyilidae. The parasite was observed by the authors for the first time in South India in March 1936 in *Scirpophaga* attacked sugarcane stems and, later on, it was also collected on *Chilo zonellus* Swinh. in Sorghum.

LIFE HISTORY OF THE MOTH BORER.

A brief account of the nature of damage caused by the moth borer and its habits is given here so that the relationship between the host and the parasite can be better understood. The damage caused by the moth borer both to the young and grown up canes is serious. The characteristic buff-coloured egg mass of the moth is generally laid on the undersurface of the leaves and the larvae on hatching find their way into the leaf roll and tunnel downwards and destroy the growing point of the plant. When full grown, it makes a short tunnel to the outside, at right angles to the original tunnel, the exit hole being closed with a thin film of the outermost leaf sheath. As it withdraws itself into the tunnel, it spins partitions of silk, one behind the other and pupates in the tunnel. It takes 2-2½ months for the pest to complete its life cycle.

DESCRIPTION OF THE PARASITE.

The description of the parasite as given by Ashmead (1903) is:

'Female—length 2.5 to 3 mm. Black and shining, the head with some small, sparse, scattered punctures, the pronotum very delicately and microscopically shagreened, the parapsidal furrows not indicated, the metathorax feebly reticulate with irregular microscopic lines at the sides, the antennae and the legs, except the coxae, anterior femora above and the middle and hind femora except at tips, honey-yellow, the anterior femora above and the middle and hind femora being embrowned or black; the extreme apex of the dorsal abdominal segments 2 to 4 are usually more or less jointly testaceous, while the wings are hyaline, the veins more or less yellowish, the stigma and parastigma being brown.'

Muesebeck (1940) has subsequently described the species in greater detail under the impression that Ashmead's description was still in manuscript,

## HABITS OF THE WASP.

The adult parasite crawls out by cutting a small hole in its cocoon and when the exit to the outside is found closed by the lid constructed by the host on the outermost leaf sheath, it cuts a hole in this lid and escapes through it. Table I gives the number of parasites reared out from host larvae collected from the field. It is seen from the table that out of 300 adults which emerged from 15 cocoon spindles the number of females was 267, the percentage being 89. In the rearings at the Insectary also, the proportion of females was about the same (81%). On an average, about 20 adults emerged from each host larva, the maximum and minimum being 32 and 9 respectively.

The adult avoids light, and immediately after emergence seeks hiding places. When supplied with a sugarcane stem with a host larva, it commences to prod with extended antennae and finally locates the lid made from the outermost leaf sheath. It easily perforates this lid and enters the larval tunnel. It then crawls about on the larva and paralyzes it. When the larva is completely paralysed the parasite begins to lay its eggs. The eggs are laid on the dorsal, ventral and lateral sides of the body but oftener on the ventral and lateral sides. They are laid singly one after the other at an interval of 2-5 minutes and generally laid in the folds of the intersegmental groove while the eggs lie parallel to the groove itself. The eggs are laid along with a slimy fluid, which later on hardens, making the egg stick firmly to the body of the host. When all the eggs are laid the parasite retreats amidst the frass which fills the tunnel and there it lives the rest of the time and then dies. If the host larva happens to be young and has not constructed any external lid the parasite enters through the leaf spindle from the top and reaches the host making its way through the tunnel packed with frass. The passage through the frass is by no means easy and the parasite often dies on its way to the host. Generally, 9-40 eggs are laid on each host. A study of Table II reveals that the parasite has not the habit of distributing its eggs. When once it enters a larval tunnel and deposits its eggs on the larva, it never seeks another host, even if it be near by. But, in the laboratory, it has been found that if the parasite after laying its eggs on a host, is removed and given another host, it may lay more eggs on it.

As a result of a series of experiments it has been found that (1) eggs are laid by a parasite only on one host even if more are supplied, (2) if one host alone is supplied to a number of parasites they attack the host simultaneously and lay eggs on it, (3) if different species of borers are given to a single parasite it prefers the one in which the host is easily accessible, (4) the parasite breeds parthenogenetically, the progeny in such cases being males, and (5) the parasite never attacks the host pupa.

## LIFE HISTORY.

The egg is glistening white in colour, translucent, elongate cylindrical and rounded off at the two extremities and measures 1 mm. The egg period ranges from 2-3 days.

The newly hatched grub measures  $1 \times \frac{1}{2}$  mm. After hatching, the grub does not change its position but sticks to the body of the host and begins to suck its juices on account of which it acquires the color of the host. When the larva is completely eviscerated, small, circular, black dots are seen on the larval skin which indicate the places of punctures made by the parasite grubs to draw the internal contents of the host. In 3-5 days the grub reaches its maximum size of  $5 \times 3$  mm. At this stage, it spins a brown cocoon which measures 8 mm. within which it pupates. These cigar-shaped cocoons are attached to one another and the cocoon spindle runs throughout the tunnel. The larval period ranges from 3-5 days.

3-6 days after the formation of the cocoon, the grub inside pupates. The pupa, when fresh, is white, but in about two days it turns black. It measures  $5 \times 2$  mm. The pupal period ranges from 4-7 days.

## DURATION OF THE LIFE CYCLE.

The total life cycle of the parasite ranges from 14-19 days, the average for 30 cases being 16 days. Table III gives the detailed life history records of the parasites.

## LONGEVITY OF THE ADULT WASPS.

The maximum longevity for a female was 48 days and for a male 4 days, the average being 20 and 2 days respectively. Table IV gives the longevity records of 7 males and 17 females.

## SEASONAL AND REGIONAL PREVALENCE.

Field observations on the incidence of the parasite show that the attack of the parasite on *Scirpophaga* is noticed in large numbers from February to April. In May and June, there is only a slight attack. But the parasite breeds continuously throughout the year on *Chilo zonellus* Swinh. in Sorghum.

EFFICACY OF *Goniozus indicus* AS A PARASITE.

The short life cycle of the parasite when compared with that of the pest and the ease with which it can be bred in the laboratory are points in its favour. The fact that the parasite attacks only one host in its life time is however a drawback. Further it is not a specific parasite in that it also attacks *Chilo zonellus* Swinh.

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TABLE I

Statement showing the number of parasites emerged from each host larva collected from the field

Serial No.	Total No. of adults	No. of females	No. of males	Date of Emergence
1	19	18	1	13-4-36
2	17	16	1	27-4-36
3	32	28	4	1-5-36
4	28	25	3	2-5-36
5	20	18	2	10-5-36
6	24	20	4	28-5-36
7	17	15	2	10-7-36
8	18	15	3	3-4-37
9	22	20	2	3-4-37
10	22	19	3	26-4-37
11	11	10	1	14-5-37
12	9	8	1	7-6-37
13	19	16	3	25-6-37
14	28	26	2	25-6-37
15	14	13	1	26-6-37

Average number of adults emerged from host . . . . . 20.

TABLE II

Oviposition records of *Goniozus indicus*

Serial No.	Emerg- ed on	1st Batch		2nd Batch		Died on	Total No. of eggs
		Laid on	No. of eggs	Laid on	No. of eggs		
1	26-3-36	28-3-36	10	29-3-36	3	15-4-36	13
2	11-4-36	12-4-36	9	15-4-36	28	21-4-36	37
3	11-4-36	22-4-36	22	24-4-36	11	30-4-36	33
4	11-4-36	16-4-36	39			19-4-36	39
5	11-4-36	15-4-36	21			17-4-36	21
6	11-4-36	16-4-36	37	22-4-36	15	29-4-36	52
7	11-4-36	19-4-36	17	20-4-36	18	30-4-36	35
8	11-4-36	19-4-36	41			23-4-36	41
9	11-4-36	20-4-36	13			22-4-36	13
10	2-5-36	6-5-36	20			13-5-36	20
11	5-5-36	7-5-36	29	14-5-36	9	20-5-36	38
12	5-5-36	25-5-36	27	30-5-36	11	4-6-36	38
13	20-6-36	23-6-36	28			25-6-36	28
14	10-7-36	19-7-36	21	23-7-36	18	23-7-36	39
15	12-3-37	20-3-37	21			31-3-37	21
16	12-3-37	20-3-37	18	21-3-36	9	27-3-37	27
17	12-3-37	20-3-37	36			30-3-37	36
18	12-3-37	20-3-37	28			31-3-37	28
19	3-4-37	11-4-37	38			12-4-37	38
20	3-4-37	8-4-37	40			9-4-37	40
21	3-4-37	13-4-37	21			18-4-37	21
22	3-4-37	8-4-37	30			15-4-37	30
23	3-4-37	11-4-37	26	14-4-37	14	16-4-37	40
24	26-4-37	30-4-37	23			1-5-37	23
25	26-4-37	30-4-37	19	6-5-37	13	8-5-37	32
26	16-5-37	23-5-37	24			28-5-37	24
27	16-5-37	29-5-37	33			31-5-37	33
28	7-6-37	10-6-37	24	14-6-37	9	19-6-37	33
29	7-6-37	13-6-37	28			20-6-37	28
30	25-6-37	4-7-37	16			6-7-37	16





TABLE IV

Longevity of *Goniozus indicus*

S. No.	Emerged on	Died on	No. of days lived
1	26-3-36	15-4-36	20
2	11-4-36	26-4-36	45
3	11-4-36	19-4-36	38
4	11-4-36	29-4-36	48
5	2-5-36	13-5-36	42
6	5-5-36	20-5-36	46
7	5-5-36	6-5-36	1
8	11-5-36	12-5-36	1
9	5-8-36	10-8-36	5
10	12-3-37	14-3-37	2
11	12-3-37	15-3-35	3
12	12-3-37	21-3-37	9
13	12-3-37	30-3-37	18
14	3-4-37	8-4-37	5
15	3-4-37	9-4-37	6
16	3-4-37	12-4-37	9
17	3-4-37	18-4-37	15
18	3-4-37	15-4-37	12
19	3-4-37	16-4-37	13
20	11-4-37	14-4-37	3
21	26-4-37	8-5-37	12
22	26-4-37	1-5-37	5
23	26-4-37	30-4-37	4
24	26-4-37	27-4-37	1